

# Outpatient Antibiotic Prescribing in Minnesota and the U. S.—2011–2016

## SUMMARY REPORT

### Background

It is widely known that antibiotics are overused, but it is challenging at the population level to determine which antibiotic prescriptions are actually needed. Thus, measuring overall antibiotic use helps us to understand the impact of antibiotic stewardship efforts and identify opportunities for improvement. Assuming that infection rates remain steady over time, a decline in unnecessary use will be reflected in a decline in overall antibiotic use.

IQVIA™, a contract research organization, tracks the number of outpatient oral antibiotic prescriptions filled in community pharmacies in the U.S. The following estimates of antibiotic prescription rates have been generated from Minnesota and U.S. IQVIA™ data.

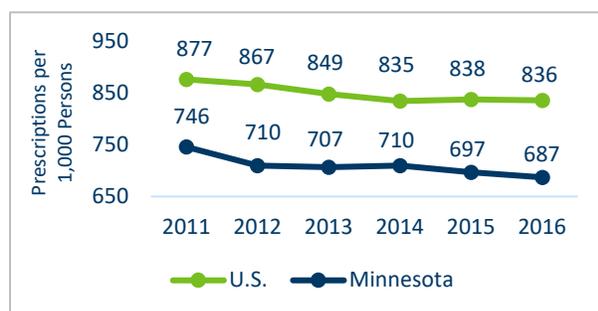
### Results

#### The total number of outpatient antibiotic prescriptions has declined.

Prescribing rates displayed in Figure 1 show a modest decline in total outpatient antibiotic prescriptions during 2011–2016. Declines occurred in Minnesota and in the U.S. as a whole. Compared to the U.S. population, Minnesotans received fewer outpatient antibiotic prescriptions.

Annual average prescription rates in Minnesota and the U.S. are displayed in Table 1, with results compared for two periods, 2011–2012 and 2015–2016. There was a five percent decrease in the annual prescriptions per 1,000 persons in Minnesota, as compared to a four percent decrease in the U.S. population.

**Figure 1. Outpatient Antibiotic Prescriptions per 1,000 Persons, 2011-2016**



*IQVIA™ Xponent® and CDC*

**Table 1. Mean Annual Outpatient Antibiotic Prescriptions per 1,000 Persons and Percent Change by Period, Minnesota and U.S.**

	2011-2012	2015-2016	% Change
<b>Minnesota</b>	<b>728</b>	<b>692</b>	<b>-5%</b>
<b>U.S.</b>	<b>872</b>	<b>837</b>	<b>-4%</b>

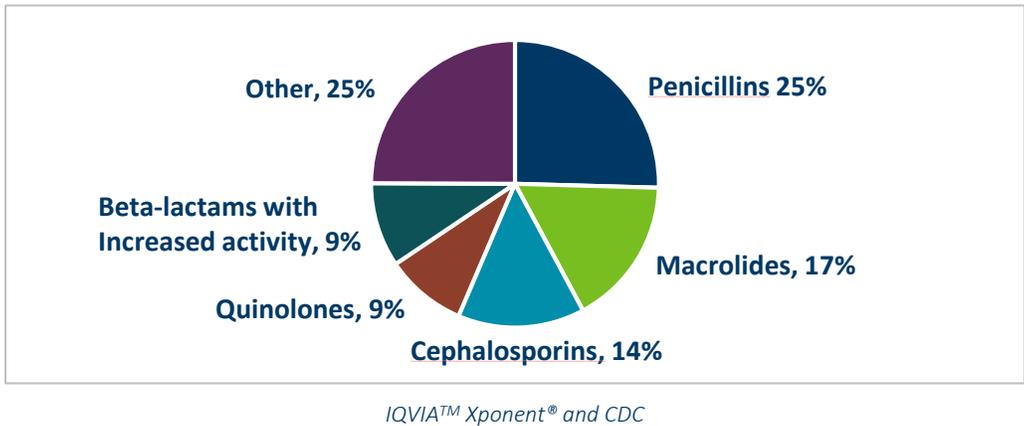
*IQVIA™ Xponent® and CDC*

**All antibiotics are not the same.**

Compared to other antibiotics, the use of certain broad-spectrum antibiotics might pose a greater risk of complications. Such adverse effects include subsequent infections with drug-resistant pathogens, like methicillin-resistant *Staphylococcus aureus* (MRSA), and gastrointestinal infection with *Clostridioides difficile*, a toxin-producing bacteria. Broad-spectrum antibiotics kill or limit growth of a greater variety of bacteria or germs than narrow-spectrum antibiotics. Because of their broader action, they often disrupt the usual balance of bacterial species in the digestive system, which can lead to the complications noted above. For these reasons, it is important to track usage of different types or classes of antibiotics.

Most or all of the antibiotics in the following drug classes are broad-spectrum antibiotics: beta-lactams with increased activity, quinolones, and macrolides. Some cephalosporins and drugs included in other classes are also broad-spectrum antibiotics. Penicillins are considered narrow-spectrum antibiotics. The proportions of antibiotic prescriptions of each drug class, out of total prescriptions filled in Minnesota during 2016, are shown in Figure 2.

**Figure 2. Outpatient Antibiotic Prescriptions by Drug Class, Minnesota, 2016**



Annual average prescription rates by drug class in Minnesota and in the U.S. are displayed on the following page in Tables 2 and 3 for two periods, 2011–2012 and 2015–2016.

Rates of macrolide prescriptions decreased substantially over this period, a 24 percent reduction in Minnesota and 19 percent nationally (Table 2). Because over 90 percent of macrolides prescribed in 2015 and 2016 were broad-spectrum (azithromycin or clarithromycin), this decline represents a considerable decrease in broad-spectrum antibiotic prescribing. In Minnesota and nationally, decreased macrolide prescriptions made the largest contribution to the overall decrease in antibiotic prescription rates during 2011–2016. The rate of quinolone prescriptions also declined, a 12 percent reduction in Minnesota and six percent nationally (Table 3).

**Table 2. Mean Annual Outpatient Macrolide Prescriptions per 1,000 Persons by Period, Minnesota and U.S.**

	2011–2012	2015–2016	% Change
<b>Minnesota</b>	153	117	-24%
<b>U.S.</b>	186	151	-19%

*IQVIA™ Xponent® and CDC*

**Table 3. Mean Annual Outpatient Quinolone Prescriptions per 1,000 Persons by Period, Minnesota and U.S.**

	2011–2012	2015–2016	% Change
<b>Minnesota</b>	76	67	-12%
<b>U.S.</b>	103	97	-6%

*IQVIA™ Xponent® and CDC*

Results for prescription rates in the cephalosporin and penicillin drug classes are shown in Tables 4 and 5, respectively. There were modest changes in prescription rates for these drug classes between the two periods.

**Table 4. Mean Annual Outpatient Cephalosporin Prescriptions per 1,000 Persons by Period, Minnesota and U.S.**

	2011–2012	2014–2015	% Change
<b>Minnesota</b>	96	97	+1%
<b>U.S.</b>	116	114	-2%

*IQVIA™ Xponent® and CDC*

**Table 5. Mean Annual Outpatient Penicillin Prescriptions per 1,000 Persons by Period, Minnesota and U.S.**

	2011–2012	2014–2015	% Change
<b>Minnesota</b>	178	178	-1%
<b>U.S.</b>	193	193	-1%

*IQVIA™ Xponent® and CDC*

## Methods and Comments

Antibiotic prescriptions filled in community pharmacies are collected by a contract research organization, IQVIA™ (formerly IMS Health and QuintilesIMS), accounting for 88 percent of total outpatient antibiotic prescriptions filled. The remainder of the prescriptions are estimated from wholesale data. Antibiotic prescriptions are counted by the location of the prescriber’s main office and not necessarily the patient’s state of residence. To calculate prescriptions per 1,000 persons, U.S. Census population estimates were used for denominators.

Minnesota-specific results from 2015 and 2016 were calculated from detailed IQVIA™ Xponent® datasets forwarded to the Minnesota Department of Health by the Centers for Disease Control and Prevention (CDC). National results and Minnesota results from earlier years were taken from reports and data available from [CDC’s Antibiotic Resistance Patient Safety Atlas \(https://gis.cdc.gov/grasp/PSA/index.html\)](https://gis.cdc.gov/grasp/PSA/index.html), which also originated from IQVIA™ Xponent® data.<sup>1</sup>

These results do not address the appropriateness of antibiotic prescribing. However, other research has shown that unnecessary antibiotic prescribing is too common – 30 percent of total outpatient antibiotic prescriptions in one study.<sup>2</sup> Educational programs for health care providers and the public are underway to increase knowledge and awareness of the problem of antibiotic overuse. Antibiotic stewardship programs address these initiatives and other strategies to encourage appropriate antibiotic prescribing. Monitoring trends in overall antibiotic prescribing is an indirect way to evaluate the effectiveness of these efforts.

## References

1. Centers for Disease Control and Prevention. Antibiotic Resistance Patient Safety Atlas. Retrieved from <https://gis.cdc.gov/grasp/PSA/index.html>
2. Fleming-Dutra KE, Hersh AL, Shapiro DJ et al. Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010-2011. JAMA. 2016; 315:1864-73.

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